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ABSTRACT

This investigation was undertaken to identify the graphonemes inherent within the structure of those English words most likely making up the reading vocabulary of elementary school children. Such knowledge was deemed to be important in determining which words should be included in the content of reading materials designed for initial reading instruction. The hypotheses were that the graphoneme is a readily identifiable matrix within the structure of English words and that a frequency distribution of graphonemes occurring in the vocabulary of elementary school children would provide priorities for teaching purposes. This study dealt only with the decoding process. In identifying words, the 1962 edition of the Thorndike Barnhart Beginning Dictionary was examined and every tenth word marked. Seven generalizations were concluded from the data. The study also lent validity to the assumption that the graphoneme is a useful matrix to be recognized within a word and enforced the concept of movement away from monosyllabic toward the early introduction of multisyllabic vocabulary. References are included. (NH)

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OCCURRENCE OF GRAPHEMES IN THE VOCABULARY
OF ELEMENTARY SCHOOL CHILDREN

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TABLE OF CONTENTS

INTRODUCTION	1
GENERAL ASSUMPTIONS RELATED TO THE DECODING OF ENGLISH WORDS	2
DESCRIPTION OF THE STUDY	3
Problem	
Hypotheses	
Delimitations	
Basic Assumptions	
Definition of Terms	
Further Limitations	
PROCEDURES	6
CONCLUSIONS	12
SUMMARY	13
BIBLIOGRAPHY	14
APPENDIX	15
WORD SAMPLE	16
OCCURRENCE OF GRAPHONEMES	27
GRAPHONEMES REQUIRING THE USE OF THE MACRON	33

OCCURRENCE OF GRAPHONEMES IN THE VOCABULARY
OF ELEMENTARY SCHOOL CHILDREN

INTRODUCTION

The usefulness of The Graphoneme Concept¹ as the prime method of word attack taught to primary grade children has been proven. There is documented evidence that young children, taught to identify graphonemes in monosyllabic words and then taught the encoding and decoding of multisyllabic words through graphoneme analysis, rapidly become independent readers.² This becomes particularly true when early reading materials are constructed which contain vocabularies stable in their grapheme-phoneme correspondence. The investigator has prepared such reading materials as a part of a reading and language development program for the native youngsters in the State of Alaska.³

This study was undertaken in an effort to identify the graphonemes inherent within the structure of those English words which would most likely constitute the reading vocabulary of elementary school children. It has become increasingly apparent that such knowledge could play an important role in determining which words should be included in the content of reading materials designed for initial reading instruction. The Chall⁴ study clearly delineated the need for the early teaching of decoding procedures. This study attempts to identify the stable structures (graphonemes), the teaching of which would logically speed up the process of independent decoding. Its findings have implications for all authors of readers, regardless of decoding methods to be employed.

GENERAL ASSUMPTIONS RELATED TO THE DECODING
OF ENGLISH WORDS

1. Children can best learn to read when the reading vocabulary is stable in its grapheme-phoneme correspondence.
2. The English language is approximately 87%⁵ stable in its grapheme-phoneme relationships, and it is this corpus of stable vocabulary which should constitute initial reading experiences.
3. Written language is, at best, only an approximation of speech.
4. Presently accepted syllabic divisions of words was arrived at in arbitrary fashion and varies from dictionary to dictionary depending upon the lexicographer employed.
 - a. The "rules" of syllabication serve little purpose in initial reading instruction.
 - b. The division of words into syllables frequently results in the formation of open syllables.
 - c. Syllabic divisions furnish poor clues to independent decoding without the presence of complicated systems of diacritical markings. The finite distinctions which characterize these markings and the fact that they vary from dictionary to dictionary renders them of little value to the young reader.
5. The closed syllable is the natural unit of the English language. The matrix here is a VC pattern, and it is this unit called a graphoneme which exemplifies the stability in English words.

DESCRIPTION OF THE STUDY

Problem:

Which graphonemes occur with sufficient frequency in the vocabulary of elementary school children to make their teaching appear necessary in enabling young children to independently decode English words?

Hypotheses:

1. The graphoneme is a readily identifiable matrix within the structure of English words.
2. A frequency distribution of graphonemes occurring in the vocabulary of elementary school children would provide priorities for teaching purposes.

Delimitations:

The source of vocabulary for this study was the Thorndike Barnhart Beginning Dictionary: Thorndike, E.L., Barnhart, Clarence L., Beginning Dictionary, Scott Foresman, Co., New York, 1962.⁶ This reference was used since it is believed to be that dictionary most commonly used in elementary schools at the primary grade level. It has been the experience of the researcher that this book is usually used by pupils in the third grade, and that this volume provides pupils' first dictionary experience.

Basic Assumptions:

1. The teaching of graphonemes promotes pupils' ability to decode English words.
2. The graphoneme (i.e., the VC pattern) is a more readily identifiable unit than the standardly accepted notion of the syllable.
3. Graphoneme analysis of every tenth word in the Thorndike Barnhart Beginning Dictionary would yield data indicating those graphonemes most frequently occurring in the vocabulary of elementary school children.

4. Beginning reading materials designed to include the findings of this study could be instrumental in promoting early independence in decoding English words.

Definition of Terms:

Graphoneme: A graphoneme is a closed syllable, one that begins with a vowel and ends with a consonant, semi-vowel, or silent "e".

an	ay	ate
it	ow	ike
ar	ew	ume

Matrix: The smallest identifiable unit within the graphoneme which retains the characteristics of the entire graphoneme.

art - the matrix is ar

end - the matrix is en

Duplicity: In connection with the identification of graphonemes, the term "duplicity" refers to those times when one spelling pattern can produce more than one speech sound -

ow - /aw/*⁷ - (cow)

ow - /ow/ - (snow)

or when one speech sound can be represented by more than one spelling.

ight - /ay/ - (night)

ite - /av/ - (kite)

*Linguistic notations of the vowel sounds according to "Modified Key to the Trager-Smith System of Phonemic Notation", Manual for Seven is Magic, Ginn & Company, Boston, Massachusetts, 1969, p. 344.

Closed Syllable: A syllable which begins with a vowel and ends with a consonant, semi-vowel, or silent "e".

Open Syllable: A syllable which begins with a consonant or semi-vowel and ends with a vowel; a single vowel sound as a syllable.

Variant Endings: The term as used here is synonymous with inflectional endings (forms) of words.

Negative Graphonemes: This term refers to those graphonemes identified which are not given the phonemic value one might expect. For example, at in a word like admiration is considered to be negative because of this inflected form of the root word "admire"; the ed in a word such as baked.

Further Limitations:

This study deals only with the decoding process, the ability of pupils to translate symbols into sounds. It ignores word choices based on content considerations.

PROCEDURES

1. The 1962 edition of the Thorndike Barnhart Beginning Dictionary was examined and every tenth word marked.
2. The words thus identified were listed, yielding a total of 1,432 words. (The total number of words in this dictionary is 14,327.) This constitutes the sample, and can be found as Appendix 1.
3. Each word on the resultant list was analyzed according to graphonemes.
 - a. The VC pattern in each word was underlined.
 - b. A rank distribution was made from greatest to least frequency of occurrence as shown in Table I; the cut-off point was determined to be ten.
 - c. All existing graphonemes were grouped according to their beginning vowels (a, e, i, o, u, y) and the actual numbers of occurrences noted for each. (Appendix 2)
 - d. The phonemic value of the vowel sound was noted. (example: ear - Was it /iyɹ/ as in "hear"; /eyɹ/ as in "bear"; /əɹ/ as in "earth"; or /är/ as in "heart"?)
 - e. Graphonemes requiring the placement of a macron over the vowel sound were noted separately.* (Appendix 3)
 - f. Open syllables were identified. (Table II)
 - g. Variant endings were noted as a separate item. (Table III)

*Part of the pedagogy of The Graphoneme Concept¹ takes into account the necessity of teaching the use of the macron.

TABLE I

RANK DISTRIBUTION OF GRAPHONEMES
IDENTIFIED IN SAMPLE

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel*</u>	<u>Example</u>
160	er	/êr/	her <u>er</u>
78	in	/in/	win <u>in</u>
75	en	/en/	ten <u>en</u>
71	or	/ôr/	for <u>or</u>
51	an	/an/	can <u>an</u>
45	on	/on/	on <u>on</u>
39	un	/un/	run <u>un</u>
37	ate	/āt/	late <u>ate</u>
37	it	/it/	hit <u>it</u>
35	et	/et/	pet <u>et</u>
34	is	/iz/	his <u>is</u>
33	at	/at/	cat <u>at</u>
33	al	/al/	Al <u>al</u>
33	ic	/ik/	panic <u>ic</u>
32	ess	/es/	dress <u>ess</u>
30	ing	/ing/	sing <u>ing</u>
28	ent	/ent/	went <u>ent</u>
28	es	/es/	yes <u>es</u>
27	om	/om/	Tom <u>om</u>
24	ec	/ec/	record <u>ec</u>

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel*</u>	<u>Example</u>
23	ab	/ab/	cab <u>a</u>
22	ap	/ap/	cap <u>a</u>
22	ed	/ed/	re <u>d</u>
21	im	/im/	hi <u>m</u>
21	al	/əl/	final <u>a</u>
20	ar	/är/	car <u>a</u>
20	em	/em/	the <u>m</u>
20	id	/id/	hi <u>d</u>
20	ul	/ul/	<u>u</u> ltimate
18	el	/el/	<u>e</u> levator
17	ac	/ak/	<u>a</u> ccent
17	as	/az/	has <u>a</u>
16	am	/am/	<u>a</u> m
16	ex	/eg/	<u>e</u> xit
15	il	/il/	civil <u>i</u>
15	if	/if/	<u>i</u> f
15	ur	/ər/	fu <u>r</u>
14	ay	/ā/	play <u>a</u>
14	um	/um/	hu <u>m</u>
14	us	/us/	bu <u>s</u>
13	ad	/ad/	ba <u>d</u>
13	ish	/ish/	wi <u>sh</u>
13	ol	/ol/	<u>o</u> live
12	är	/ar/	<u>a</u> rid
12	op	/op/	ho <u>p</u>

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel*</u>	<u>Example</u>
11	ant	/ant/	pl <u>an</u> t
11	ep	/ep/	ste <u>p</u>
11	ig	/ig/	pi <u>g</u>
11	ill	/il/	wi <u>ll</u>
11	ow	/ō/	sno <u>w</u>
11	ure	/ür/	su <u>re</u>
10	ag	/ag/	ba <u>g</u>
10	ef	/ef/	che <u>f</u>
10	ip	/ip/	li <u>p</u>
10	ōs	/ōz/	po <u>sing</u>

An examination of the graphonemes thus identified leads to some interesting observations. For example: er occurs in only one monosyllabic English word (her), yet it occurred with the highest frequency of all graphonemes; affixes appear important in that they apparently account for much of the stability in grapheme-phoneme correspondence; one might have expected eck (which occurred only three times in the sample), or ick (six times) to be more common than ec (24 times) or ic (33 times), but such was not the case; only two examples of duplicity occurred in this high frequency count (al and ar), both exemplifying one grapheme producing two phonemes, while there were no instances of the reverse - one phoneme represented by two graphemes.

*Phonemic notations are as given in the Thorndike Barnhart Beginning Dictionary.

TABLE II
OPEN SYLLABLES

y (ĩ) - 99	oo - 3
le - 48	ee - 3
ĩ - 12	le (lĩ) - 2
a (ə) - 12	y (ĩ) - 2
o - 10	ie - 2
a - 9	ly (lĩ) - 2
ĩ - 10	u (oo) - 1
u - 8	ea - 1
e - 5	ue (oo) - 1
i (ē) - 5	

TABLE III
VARIANT ENDINGS

tion - 37	ial - 3
ious - 8	ient - 3
sion - 9	ian - 1
ion - 3	ean - 1

TABLE IV

SUMMARY OF ANALYSIS OF SAMPLE

Number of Words in Sample	Number of Syllables in Sample	Number of Closed Syllables (graphonemes) in Sample	Number of Open Syllables in Sample
1,432	3,101	2,866	235

1. The words in this sample averaged 2.16 syllables, 2.0 of which were closed.
2. 92.4% of the total number of syllables is closed.
3. An examination of the open syllables (Table II) reveals that the majority of these occurred in two endings: "y" and "le".

CONCLUSIONS

The following generalizations can be assumed to be valid based upon the data acquired. (A summary of this data can be found in Table IV.)

1. There exists within the structure of English words a corpus of graphonemes which occur with sufficient frequency to warrant their teaching. (See Table I)
2. Priorities can be established to further the utility and reliability of word choice in initial reading vocabulary.* For example, the pronoun "her" should be taught early, since the graphoneme er occurred the greatest number of times in the 1,432 words analyzed.**
3. Duplicity in graphonemes does not occur as often as one might suspect.
4. The short vowel phoneme occurs more often than any other.
5. On the basis of this sample, there can be identified more closed than open syllables.
6. Open syllables occur most often in lateral position in English words. (See Table II)
7. Exceptions to graphoneme analysis most frequently occur in variant endings. The root forms of these same words are usually quite stable.

*It must be kept in mind that the author is dealing only with the selection of useful vocabulary for the promotion of independence in decoding. There are other important criteria for the selection of initial reading vocabulary. For example, "organ" would be a word easily decodable, since, according to this study, or occurred 71 times and an occurred 51 times, while ith as found in the word "with" occurred only once. However, "with" is certainly a more useful English word than "organ" because of its frequency of use.

**In the present edition (1969) of the Alaskan Readers, "her" is introduced in Level Five. However, in the revision of the Alaskan Readers, the introduction of this pronoun will be moved to an earlier level because of the results of this study.

SUMMARY

The data furnished by this study has implications for all who would write materials for initial reading instruction if their aim is to rapidly promote pupils' ability to independently decode English words. Any materials so constructed would appear to be instrumental in the acquisition of this reading skill.*

Furthermore, the study lends validity to the assumption that the graphoneme is, indeed, a useful matrix to be recognized within a word. The ratio of open versus closed syllables is greater than ten to one in favor of the closed syllable. The infrequent occurrence of duplicity and of negative graphonemes implies a stability inherent in this procedure.

The study also enforces the concept of movement away from monosyllabic and toward the early introduction of multisyllabic vocabulary. If pupils can initially be taught monosyllabic words containing graphonemes of high frequency as identified within the structure of English words, they should be able to transfer this knowledge as an important tool in independently decoding multisyllabic vocabulary. This transference should occur with minimal difficulty.

While the intent of the study was not to enforce The Graphoneme Concept, the resultant data does verify previous findings. It would appear that if we were to:

1. use an initial reading vocabulary employing those graphonemes most frequently found in English words,
2. teach pupils to identify graphonemes in English words,
3. teach the decoding of some words through the use of the macron,
4. teach pupils a small corpus of high frequency open syllables at the ends of English words,
5. teach pupils the effect of certain variant endings of English words,

we could, coupled with a program of phonics instruction aimed at teaching consonant grapheme-phoneme correspondences, greatly advance pupils' early reading achievement.

*The researcher is well aware that decoding (the translation of symbol into sound) is only one of the important criteria to be considered when selecting vocabularies. This criterion appears to be over-emphasized in this study only because this is the area under scrutiny.

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APPENDIX

APPENDIX 1

WORD SAMPLE

abbot
abject
abominable
absent
abstract
accelerator
accident
accomplish
accurate
acknowledge
acquit
actress
adaptation
adhesive
admiral
adopt
advance
adverse
aerial
affection
afloat
afterward
aggregate
ago
ahead
aircraft
airway
album
alien
alley
ally
aloof
alter
alum
amber
America
among
an
and
angler
animate
announce

answer
antenna
antidote
anxious
apart
apology
appeal
appliance
apprehend
approximate
Arabia
arc
arctic
arid
arm
armpit
array
art
artistic
ashamed
asparagus
assassinate
assignment
assume
astonishing
at
atom
attain
attire
audacious
August
authorize
available
aversion
avowal
awful
axis

backbone
bacteria
bail
balance

ballad
ban
banjo
Baptist
bard
bark
barrel
basement
bass
bathroom
battlefield
bazaar
bean
beautiful
becoming
bedtime
bees wax
befriend
begun
behold
bell
belt
benevolent
beset
bestow
betroth
beware
bicuspid
bill
biography
bishop
black
blade
blaze
blessing
blister
blockhouse
blossom
blubber
bluing
board
bob

boil
bombardment
boo
born
bottom
bound
bow
box
brace
bramble
brawn
breast
breeze
bride
brigand
bring
broaden
bronchial
broth
browse
brutal
buckwheat
bugbear
bulge
bullfinch
bun
buoy
burlap
burst
bust
butter
buy
bystander

cactus
calculate
call
came
Canada
candor
cannonade
cantankerous
cape
capsize
car
cardboard
careless
carnival

carrot
cascade
casserole
catalpa
catechism
catsup
cavalcade
cayuse
celery
censer
central
certain
chair
chameleon
chant
char
charm
chat
checkbook
cheerless
chess
chicle
children
China
chivalrous
chop
Christ
chronicler
churl
cinnamon
circumference
citizenry
civilization
clamor
clarion
classroom
cleanness
cleave
clerk
clime
cloak
closeness
cloudless
cluck
coachman
coat
cobweb
cocoa

coffer
cold
collector
colonization
colossal
comedian
comical
commencement
commodity
communication
company
compatible
complacency
complexity
composite
compromise
concede
concern
conclude
condense
confederacy
confident
conform
congregate
Connecticut
consecrate
considerable
console
constant
constrict
consumption
contempt
contestant
continuous
contradict
contrive
convention
convict
cool
copper
corkscrew
cornet
corporal
correspond
corselet
cottage
council
counteract

county
court
covenant
cow
cowhide
crab
cram
crate
craze
creator
crept
crib
crisis
crockery
cross
crossways
crucial
cruiser
crustacean
cuckoo
cull
culvert
curator
currant
curtsy
cut
cylindrical

dahlia
dally
damsel
dapper
dart
dauntless
deacon
dear
debtor
decency
decision
decorum
deepen
defender
deficient
deft
delegation
delirium
demand
demure
dental

dependent
depth
descend
deserve
desolate
dessert
detachment
detestable
devoid
diacritical
diameter
did
difficult
dignity
dimension
dinner
dipper
dirge
disagreeable
disaster
discolor
discouragement
discriminate
disfigure
dishonor
disloyal
disobey
display
disquiet
dissipate
distillation
distribute
diver
divisible
dock
does
dole
domesticate
done
dormant
double
dove
downhill
dozen
drake
drastic
dray
dredge
drew

drip
drop
drudge
drunken
duck
duke
dunce
dusk
dwelling
dynasty

earl
earth
east
eaves
economic
edge
educate
effectual
Egypt
either
elbow
electrify
elevate
ellipse
elusive
embattled
embroidery
eminence
empire
emulation
enchantress
encumber
endosperm
energy
engineer
engulf
enlist
enrollment
enterprise
entice
entry
envoy
equalize
equivalent
erosion
escort
essential
eternal

evaporate
eventual
everything
exact
exasperation
except
excitement
excuse
exhale
existence
expectation
experiment
exploit
expound
extent
extraordinary
eye

fable
factor
failure
faithless
famed
fanciful
farm
farthing
fastness
fathom
faun
fearless
fed
feign
feminine
ferret
festal
fever
fiddler
fiendish
fiftieth
file
filter
finch
fir
fireman
first
fishhook
five
flake
flashlight
flaunt

fled
flew
flight
flirt
Florida
flower
fluster
foal
foil
follow
foolish
footpath
forbearance
ford
forego
foremost
foretold
forgetfulness
form
forsaken
fortify
fossil
foundry
fowl
frailty
fraternal
freeze
frequent
friction
fright
frock
frothing
fruitless
fullness
fungus
furniture
fuse

gait
gallery
gander
garden
garret
gate
gauze
gelatin
genie
gently
germ
giant

gill
gipsy
girt
glade
glass
glimmer
glorious
glutton
goat
goddess
goldfish
goodly
gopher
gossip
grab
graduation
grandchild
grange
grapple
gratification
gravity
greatly
greet
grievance
grindstone
grocery
ground
grown-up
guard
guilt
gully
gunwale

had
hair
halfway
halt
hamper
handkerchief
hangar
happy
hardly
harm
harpoon
hast
hateful
haven
hay
hazel
headlight

healthful
heartbroken
heater
Hebrew
height
helm
hem
herb
hereby
heritage
hesitate
hidden
highway
him
his
hittler
hobnail
hold
holster
homespun
honeycomb
hook
horde
horrify
hose
hostess
hourly
hove
huddle
humanity
humor
hundredth
hurl
husband
hut
hygiene

Idaho
idleness
ignoble
illiterate
illustrate
imagine
immemorial
immortal
impassable
imperative
impetuous
importation
impression

imprudent
inaccessible
inauguration
incidentally
include
inconsistent
incredibly
indelible
indicate
indignant
individual
induce
ineffectual
inexhaustible
infant
inferiority
inflammable
information
ingratitude
iniquity
injury
inmost
innovate
insane
insert
insistence
install
instinctive
insufficient
intake
intend
intercede
interference
intermingle
interpreter
interstate
intimate
intrepid
inundate
invent
investigator
invoke
ire
irresolute
isle
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jade
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jay
jellyfish
Jesus
jeweler
job
joke
journalist
jubilant
jugular
juncture
just

keenness
kept
keynote
kiln
kindergarten
gingly
kith
kneel
knighthood
knotty

lack
ladybug
lameness
landlady
lantern
larder
lash
late
latter
laundry
lawmaking
layer
leaf
leant
lease
lecture
left
legion
lemonade
lent
let
liberal
lichen
life
lifetime
lighthouse
likelihood

limb
limpid
links
liquid
literate
livelong
lizard
loath
location
locust
logic
long
loom
lopsided
lost
lovable
lowly
lucky
luminous
lurid
lye

machinist
made
magistrate
magnitude
mailman
maintain
maker
mallard
man
manful
manicure
manor
manuscript
march
mark
maroon
marshy
masculine
massage
mat
mathematician
maul
mayhap
meager
meanness
mechanically
mediate
medium

mellow
memorize
mental
mercury
merrily
message
meter
mettle
microscope
middy
midway
migration
milk
milliner
mind
minion
mint
mire
mischievous
mishap
miss
mist
misty
mixer
mode
Mohammedan
molding
momentary
monk
monstrous
moonbeam
moral
morose
mosque
motherly
motorcycle
mound
mourn
move
mown
muddle
mule
mum
murderer
mushroom
muskrat
mute
my

namesake
nasal
natural
nausea
nearby
necessity
needlework
neigh
nest
neutron
New Jersey
New World
nickname
nightmare
ninth
nocturnal
nominee
noontide
northeast
northwest
notch
notorious
now
nuisance
nurse
nymph

obedience
obligation
obscure
obstacle
occasional
ocelot
odds
offender
offset
oil
olden
omelet
oneself
onward
operate
opposite
oral
orbit
ordinarily
organize
originate
ostentatious
ourselves

outcast
outermost
outlaw
outpost
outskirts
outwit
overcame
overflow
overheat
overlord
overseas
overstep
overweight
oxbow

pad
pagoda
pair
palace
palpitate
panda
pantry
parable
paralyze
pardon
parka
parsnip
particle
partridge
passion
pasteurize
pate
patient
patter
paving
peaceful
pearly
peculiar
peek
pelican
pence
penitence
pension
peppermint
perch
perforate
periodic
permission
persecute

personal
pertain
pester
petroleum
pharmacist
Philippine
phonetic
physically
pick
picture
pig
pike
pillar
pincushion
pinto
pistol
pitfall
placid
planet
plastic
player
plea
plentiful
ploughman
plumber
plutonium
pocket
point
polar
polio
poll
pompon
poodle
poppy
pore
port
portico
possessive
postage stamp
postpone
potion
pour
practicable
praiseworthy
precaution
precipitous
prediction
prehistoric
preparatory

presentable
press
presumptuous
prevailing
priceless
primary
primrose
prior
privateer
probable
proclaim
production
profile
progressive
prominence
pronoun
propensity
proposal
prospective
protein
provender
provocation
pry
publish
puffy
pulverize
punctual
punt
pure
purport
push
pyramid

Quaker
quarry
quaver
quick
quilt
quoit

racial
radical
rag
raiment
rake
ranch
rap
rarely
rather

rave
raw material
read
reality
rear
rebellious
recede
recipe
recline
reconcile
recover
recur
redouble
reek
referee
reflector
refresh
refuse
regime
regularly
reiterate
relatively
reliable
relish
remedy
remorse
renewal
repair
repel
report
reproachful
repulsive
requite
reserve
resigned
resonant
respectively
rest
restriction
retaliate
retract
revelation
reverie
revolution
rhododendron
riches
ride
rig
rightly

ring
ripe
rival
roam
robust
rod
role
romantic
roost
rosette
rouge
rouse
row
rubbish
ruff
rumble
rung
russet

sacrifice
sag
sailor
salesman
salty
sanctity
sane
sap
satellite
saucepan
savior
sawmill
scaffold
scan
scare
scent
schooling
scientist
score
scourge
scraper
scribe
scrutinize
scurry
seagoing
seaman
seaside
secluded
secrete
sediment

seemingly
seldom
selfish
semaphore
sensation
sentiment
sequel
serial
server
setting
seventy
sex
shady
sham
shanty
shatter
sheathe
sheer
shelter
shied
shiny
shirk
shod
shop
shorten
should
shower
shrill
shrunk
shy
sideline
sieve
significance
silk
silverware
simultaneous
singer
sip
site
sixtieth
skid
skinny
skylight
slake
slave
sleepless
slicker
slingshot
sloop

slow
slunk
smallpox
smit
smoky
snack
snaredrum
snipe
snowdrift
snuggle
soccer
sodden
soil
sole
soloist
someone
songbird
sorcerer
sort
sour
southerly
sovereignty
spaghetti
spanking
spasm
special
speck
sped
spellbound
Sphinx
spin
spirit
splendor
spoken
spore
sprain
springboard
spun
squad
squash
squirm
stag
stake
stamen
standpoint
stare
starvation
station
stave

steak
steed
stepfather
stew
stile
stink
stop
storm
straggle
strand
strategy
street
stricken
stringy
stroke
strut
studio
stunk
surgeon
sublime
subsequent
substitution
succeed
such
suffering
suggest
sulk
summer
sunburnt
sung
sup
supermarket
supple
supposing
surf
surpass
surveyor
suspicion
swamp
sweat
sweetish
swiftness
switch
swum
symmetrical
syrup

tact
taint
tall
tangible
tape
tarantula
tartan
tattle
taxi
teamwork
teepee
television
temperature
tenacious
tenderness
tension
terminus
territory
tetanus
thankless
thee
theology
therein
thermostat
thickly
think
thistle
those
thrasher
threshold
throng
thumb
thus
ticket
tie
tiller
timothy
tinware
tired
toast
toil
toll
ton
took
topic
torment
tot
toughen
towel

trace	unprepared	watercourse
trademark	unremitting	waterway
trail	unsatisfactory	way
trance	unsettle	weakling
transgress	unspeakable	weariness
transom	untie	web
trappings	untrue	weed
tread	unwholesome	weft
treaty	unwound	wellborn
trencher	upkeep	wept
tribe	uproar	westwards
tricolor	upturn	whatever
trinket	us	when
trivial	usher	wherein
tropical	utter	whetstone
trousers		whimsical
true	vagabond	whisk
trustful	valise	whiten
tub	vane	wholesale
tuition	varied	why
tuneful	vastness	widen
Turk	vehement	wigwag
turpentine	vendor	will
tweed	ventilation	win
twill	verdant	windmill
two	verse	wing
typify	vestige	wintergreen
	vial	wise
unaccented	vicinity	wither
unavoidable	vigil	wives
unbolt	villain	wolverine
uncertain	vineyard	wonderful
unconstitutional	violet	woodcraft
underclothes	virtue	woodwind
underline	visionary	wording
undertaker	vivacious	workmanlike
undisputed	vociferous	worry
unduly	voluble	worthy
unequal	vouch	wrangle
unfamiliar	vying	wreck
unfortunate		wretched
unguent	wager	write
unheeded	waiter	wrought
unify	wall	
United States	wander	
unkindly	warden	
unlimited	warmth	
unmindful	wary	
unobserved	wasteful	

yard
yearling
Yellowstone
yielding
you
youth

Zeus
zone

APPENDIX 2*

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "a"

an-51	ack-5	**ac-2	aise-1
ate-37	ak-5	ac (as)-2	aith-1
at-33	ath-5	ab-2	al-1
al-33	aw-5	aim-2	all (ul)-1
ab-23	ash-4	ait-2	alf-1
ap-22	ass-4	aze-2	az-1
**at-21	ast-4	al (all)-2	alt-1
al (ul)-21	av-4	ang-2	amp-1
ar-20	arm-4	ape-2	amp (omp)-1
ac-17	ard (erd)-4	aph-2	an (ahn)-1
as-17	ar (er)-4	as-2	ange-1
am-16	age-4	ac (ace)-1	aord (ord)-1
ay-14	ame-4	aar-1	ap-1
ad-13	ark-3	ach (atch)-1	ar-1
ar-12	ank-3	ach (ush)-1	arch-1
ant-11	ave-3	ad (od)-1	**as-1
ag-10	ad-3	az-1	asm-1
and-8	ac-3	ayh (ā)-1	aste-1
ance-8	ah (uh)-3	auze-1	at (uh)-1
are-8	ale-3	auth-1	at (ut)-1
ail-8	ax-3	aunt-1	ate (ut)-1
ade-8	am-3	aus-1	ath (ahth)-1
ake-7	art-3	aund-1	auc (aus)-1
act-7	ane-3	awn-1	aud-1
at-7	arc-2	aul-1	
all-7	aug-2	aer-1	
ain-6	ar (or)-2	aft-1	
all (al)-6	ag (ug)-2	ag-1	
ard-6	ag (aj)-2	ahl (ul)-1	
av-6	af-2	ain (un)-1	
air-5	ace-2	aint-1	

*On occasion, phonetic spelling follows the graphoneme to illustrate differences in the phonemes produced.

**Negative graphonemes.

OCCURRENCE OF GRAPHEMES

BEGINNING WITH "e"

er-160	er (air)-4	eeze-2	eight (āt)-1
en-75	eam-3	eg (ej)-2	**eign-1
et-35	eb-3	eh (ā)-2	eign (ain)-1
ess-32	eck-3	ēl-2	eight-1
es-28	ēd-3	ēn-2	eigh (ā)-1
ent-28	ede-3	ēs-2	eith (ēth)-1
ec-24	ēy-3	esh-2	el (ul)-1
ed-22	eet-3	ēt-2	**el-1
em-20	eft-3	eac-1	elt-1
el-18	ert-3	eace-1	elm-1
ex-16	ead (ed)-2	eaf-1	empt-1
ep-11	ead-2	eal (el)-1	**ēn-1
ef-10	eag-2	eal-1	ense-1
ence-9	ear (air)-2	eant (ent)-1	eon (yun)-1
ew-9	er (ār)-2	earl (erl)-1	eone-1
est-9	eth-2	ear (ar)-1	ēp-1
ell-8	ear (er)-2	ease-1	**ep-1
ev-8	eas-2	east (est)-1	epth-1
ear-6	east-2	eat (ate)-1	erb-1
eed-6	EEK-2	eat (et)-1	ere-1
end-6	erm-2	eathe-1	ere (air)-1
ēq-6	ern-2	eak (āk)-1	erch-1
ēr-6	erse-2	eak-1	erve-1
**es-6	ēc-2	eaut (ūt)-1	ete-1
ean-4	ec (es)-2	eave-1	ette (et)-1
eat-4	ect-2	**eb-1	eur (ur)-1
eep-4	**ed-2	ēb-1	eus (ōos)-1
eer-4	ein-2	ebt-1	eut (ōot)-1
eg-4	elf-2	ec (is)-1	eum (ium)-1
ept-4	erk-2	ech (ek)-1	**ew-1
	een-2	edge-1	**ey-1
		edth-1	ey-1
		eel-1	ey (ay)-1
		eem-1	ey (āy)-1
		ēg (ej)-1	eye (ī)-1
		**eg-1	
		ēg-1	

OCCURRENCE OF GRAPHEMES

BEGINNING WITH "i"

in-78	**ic-3	ith-1	inx (inks)-1
it-37	īc-3	īz-1	iol-1
is-34	ice-3	ian (ien)-1	ion (on)-1
ic-33	ict-3	iar (yər)-1	ion (un)-1
ing-30	ike-3	ic (is)-1	ior (yər)-1
im-21	īm-3	idge-1	ipse-1
id-20	īn-3	ied-1	ipt-1
il-15	ise-3	ied (ēd)-1	iq (u)-1
if-14	ite (it)-3	iend (end)-1	īr-1
ish-13	ive-3	iend (ē)-1	ird-1
ig-11	ibe-2	iene (ēn)-1	irge-1
ill-11	īd-2	ief-1	irst-1
ip-10	ield-2	iev (ē)-1	irt-1
ight-9	ign-2	iev (iv)-1	irk-1
ive (iv)-9	ile-2	ieve (iv)-1	irm-1
ist-8	ilk-2	ife-1	ise (ēs)-1
ize-7	inch-2	if-1	ism-1
ib-6	īnd-2	īg-1	iss-1
ick-6	ind-2	igh (ī)-1	īst-1
ide-6	ink-2	ige (ij)-1	itch-1
iv-6	int-2	īgn-1	
ine (in)-5	ipe-2	**īl-1	
ine-5	ir (ear)-2	**il-1	
ir-5	**is-2	il (ul)-1	
ire-5	īs-2	ild-1	
iv-5	**it-2	iln-1	
ial (iul)-4	ix-2	ilt-1	
ime-4	iz-2	**imb-1	
ite-4	īt-1	iem (eme)-1	

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "o"

or-71
on-45
om-27
ol-13
op-12
ow-11
os-10
old-9
ost-8
ot-8
ov-8
ow-8
ob-7
od-7
ound-7
ous (us)-7
oc-6
or (er)-6
out-6
ov-6
ock-5
oil-5
ol-5
ole-5
one-5
ong-5
ood-5
ort-5
os-5
ous-5

ob-4
od-4
ook-4
oom-4
oon-4
ose-4
oss-4
oun-4
ox-4
oard-3
oat-3
off-3
og-3
oid-3
ok-3
oke-3
om-3
on (un)-3
ool-3
ore (or)-3
orm-3
ot-3
oth-3
oach-2
oc (os)-2
oc-2
og-2
oit-2
oint-2
ol (ul)-2

om (um)-2
on-2
ond-2
op-2
ord-2
ork-2
ote-2
oth-2
ou (oo)-2
oub (ub)-2
our (er)-2
our (or)-2
ouse-2
own-2
oad (aud)-1
oak-1
oal-1
oam-1
oar-1
oast-1
oath-1
oc (os)-1
ode-1
oes (uz)-1
of-1
oh-1
oll-1
oll-1
olt-1
ome (um)-1
omb-1
one (un)-1
one (wh)-1
ong (ung)-1

onk-1
ood (oo)-1
oof-1
oop-1
oost (oo)-1
oot-1
ope-1
oph-1
opt-1
**or-1
orde-1
ork (erk)-1
orn-1
orse-1
ost-1
**ot-1
otch-1
ouch-1
oud-1
ought-1
ould-1
ough (ow)-1
ough (uf)-1
ounce-1
ourge-1
ourn-1
ourt (ort)-1
outh (uth)-1
outh (ooth)-1
ove-1
ove (uv)-1
ove (oo)-1
owl-1
owse-1
own-1

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "u"

un-39
ul-20
ur-13
um-14
us-14
ure-11
ut-9
ub-8
up-7
ug-5
ūl-5
ust-5
ude-4
unk-4
use-4
ute-4
uck-3
uf-3
ull-3
ung-3
ūr-3
ush-3
ūt-3
ual-2
ūb-2
uc-2
ud-2
ud (ōō)-2
ūn-2

url-2
urn-2
usk-2
**ut-2
uard (ard)-1
**ūc-1
ūc-1
uce-1
uch-1
uck (ōō)-1
ūd-1
udge-1
uent (went)-1
uff-1
uilt-1
uis (ew)-1
uis (ōō)-1
uit-1
uke-1
ul (ōō)-1
ule-1
ulf-1
ulge-1
ulk-1
ult-1
ūm-1
um (uh)-1
umb-1
ume-1

ump-1
unce-1
und-1
unt-1
**uoy-1
up (ōō)-1
ur (er)-1
urf-1
urk (erk)-1
urse-1
urst-1
ūs-1
**us-1
uy (ī)-1

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "y"

ym-2
yc-1
ye ($\bar{i}$)-1
yg ($\bar{i}$)-1
yn-1
ypt-1
yr-1
ys-1
yth (eth)-1
yze-1

APPENDIX 3

GRAPHONEMES REQUIRING THE USE OF THE MACRON

āt-7	ēq-6	īv-5	ōw-11	ūl-5	ȳn-1
āk-5	ēd-3	īc-3	ōs-10	ūr-3	
āv-4	ēy-3	īm-3	ōv-8	ūt-3	
ād-3	ēc-2	in-3	ōus (us)-7	ub-2	
ac-3	ēl-2	id-2	oil-5	un-2	
ām-3	ēs-2	ind-2	ob-4	uc-1	
ab-2	ēt-2	is-2	od-4	**uc-1	
as-2	eb-1	it-2	og-3	ud-1	
ag-1	eg (ej)-1	iz-1	ok-3	um-1	
al-1	eg-1	ig-1	om-3	us-1	
az-1	ep-1	ign-1	ot-3		
ap-1		**il-1	oc (os)-2		
ar-1		ir-1	on-2		
		ist-1	op-2		
			oth-2		
			of-1		
			oh-1		
			oll-1		
			ost-1		
			**ot-1		
			own-1		

**Negative graphonemes.